City of Santa Monica

Calendar Year 2007 CNEL Contours for
Santa Monica Municipal Airport

Mestre Greve Associates

April, 2007
Outline:

• Background Information on Measuring Noise (Noise 101)
• Calendar Year 2007 CNEL Contours and Measurement Data
The Effects of Weather on Sound Propagation

Source: Adapted from Vancouver International Airport, Noise Management Report.
Single Event Noise

Hourly Noise

24 Hour Noise

Single and Cumulative Noise Metric Definitions
Examples of CNEL

- Typical Outdoor Location
- Apartment Next to Freeway
- 3/4 Mile From Touchdown at Major Airport
- Downtown With Some Construction Activity
- Urban High Density Apartment
- Urban Row Housing on Major Avenue
- Old Urban Residential Area
- Wooded Residential
- Agricultural Crop Land
- Rural Residential
- Wilderness Ambient
Speech Interference

Permissible Distance Between a Speaker and Listeners for Specified Voice Levels and Ambient Noise Levels

(The Levels in Parentheses Refer to Voice Levels Measured One Meter From the Mouth.)
Sleep Interference

![Graph showing the relationship between indoor sound exposure level (SEL) and percent awakening. The graph includes data from Field Studies, FICON 1992, and FICAN 1997.]
Annoyance

USAF (Finegold et al 1992) DATA 400 POINTS
% HA = 100/(1 + EXP (11.13 - .141 LDN)) (Solid Line)
SCHULTZ DATA 161 POINTS
% HA = 100/(1 + EXP (10.43 - .132 LDN)) (DASHED Line)

<table>
<thead>
<tr>
<th>CNEL/DNL, dB</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
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<td>4.03</td>
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<td>37.05</td>
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Calculated % HA Points

% HA = 100/(1 + EXP (11.13 - .141 LDN)) (Solid Line)
% HA = 100/(1 + EXP (10.43 - .132 LDN)) (DASHED Line)
Annoyance
# FAR Part 150 Noise Land Use Compatibility

<table>
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<tr>
<th>Land Use</th>
<th>Yearly DNL, dB</th>
<th>&lt; 65</th>
<th>65-70</th>
<th>70-75</th>
<th>75-80</th>
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<td>Y</td>
<td>25</td>
<td>30</td>
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NI: Where must be allowed, NLR 25 and 30 dB, mechanical ventilation, outdoor noise problems remain.
Factors that Affect Individual Annoyance to Noise

**Primary Acoustic Factors**
- Sound Level
- Frequency
- Duration

**Secondary Acoustic Factors**
- Spectral Complexity
- Fluctuations in Sound Level
- Fluctuations in Frequency
- Rise-time of the Noise
- Localization of Noise Source

**Non-acoustic Factors**
- Physiology
- Adaptation and Past Experience
- How the Listener's Activity Affects Annoyance
- Predictability of When a Noise will Occur
- Is the Noise Necessary?
- Individual Differences and Personality

*Source: C. Harris, 1979*
Noise Measurement Locations
2007 Annual Operations

2007 Operations Data

Annual Operations

127036

18575

Total Aircraft
Jet Operations
Aircraft Single Event Noise

Departure Noise at RMS 1

Arrival Noise at RMS 2
Departure Single Event Noise

Departure SENEL at RMS 1

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<th>SENEL, dBA</th>
<th>Props:</th>
<th>BEC58</th>
<th>GASEPV</th>
<th>CNA441</th>
<th>GASEPF</th>
<th>Jets:</th>
<th>FAL20</th>
<th>CIT3</th>
<th>IA1125</th>
<th>LEAR35</th>
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2007 Measured CNEL
Historical CNEL

SMO CNEL History 1989 - 2007
# Measured vs. Computer Model CNEL

<table>
<thead>
<tr>
<th>Site</th>
<th>Measured CNEL</th>
<th>Modeled CNEL</th>
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<tbody>
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<tr>
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Calendar Year 2007 CNEL